ON PARAMETRIZATION OF THE ISOVECTOR M1 RESONANCE AND NATURE OF THE PYGMY DIPOLE RESONANCE IN SPHERICAL NUCLEI

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We discuss the characteristics of the isovector M1 and pygmy dipole resonance (PDR) concerning the nuclear data evaluation on the base of modern giant resonance physics. (See also the motivation of the work in the contribution to this conference by S.Kamerdzhiev).

1. We have parametrized the most reliable experimental data for the M1 resonance in ^{208}Pb [1] using the Lorentz resonance shape and the least squares method. It was obtained that the resonance width $\Gamma = 0.36$ MeV which is in sharp contrast to the value $\Gamma = 4$ MeV recommended for all nuclei botn in the RIPL-1 (1998) and in RIPL-2 (2002). A noticeable difference between experimental and recommended width values has been also obtained for several other nuclei. We propose other methods to parametrize M1 resonances based on microscopic approaches.

2. During last decade much interest has been spent on the investigation of the PDR [2,3]. One of the main motivation was that the corresponding nuclear structure information is of great astrophysical interest [3,4].

We have calculated for the first time the PDR within two microscopic approaches, namely, the Extended Theory of Finite Fermi Systems (ETFFS) [5.6] and its partial case, i.e. the Continuum Quasipaticle Random Phase Approximation (CQRPA), for three stable and unstable tin isotopes ^{120}Sn, ^{104}Sn and ^{132}Sn. The principal difference between the ETFFS and CQRPA is that the former takes into account the phonon coupling while the latter does not. It was obtained that the inclusion of the phonon coupling increases within the factor of 2-4 the E1 strengths summed in the (0-$< E >$/2) energy interval, where $< E >$ is the mean energy of the GDR, and also it increases very noticeably the strengths summed in the (0-12) MeV interval for all the nuclei considered. A reasonable description of the GDR characteristics including their widths was obtained too.

We can conclude that accounting for the phonon coupling is necessary for the description of the PDR in any microscopic approach. Because the ETFFS has universal parameters of the Landau-Migdal interaction and account for the single-particle continuum and the phonon coupling, the use of the ETFFS gives a possibility at present to try to calculate and parametrize the PDR and other photonuclear data for many spherical nuclei including the drip-line ones.

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